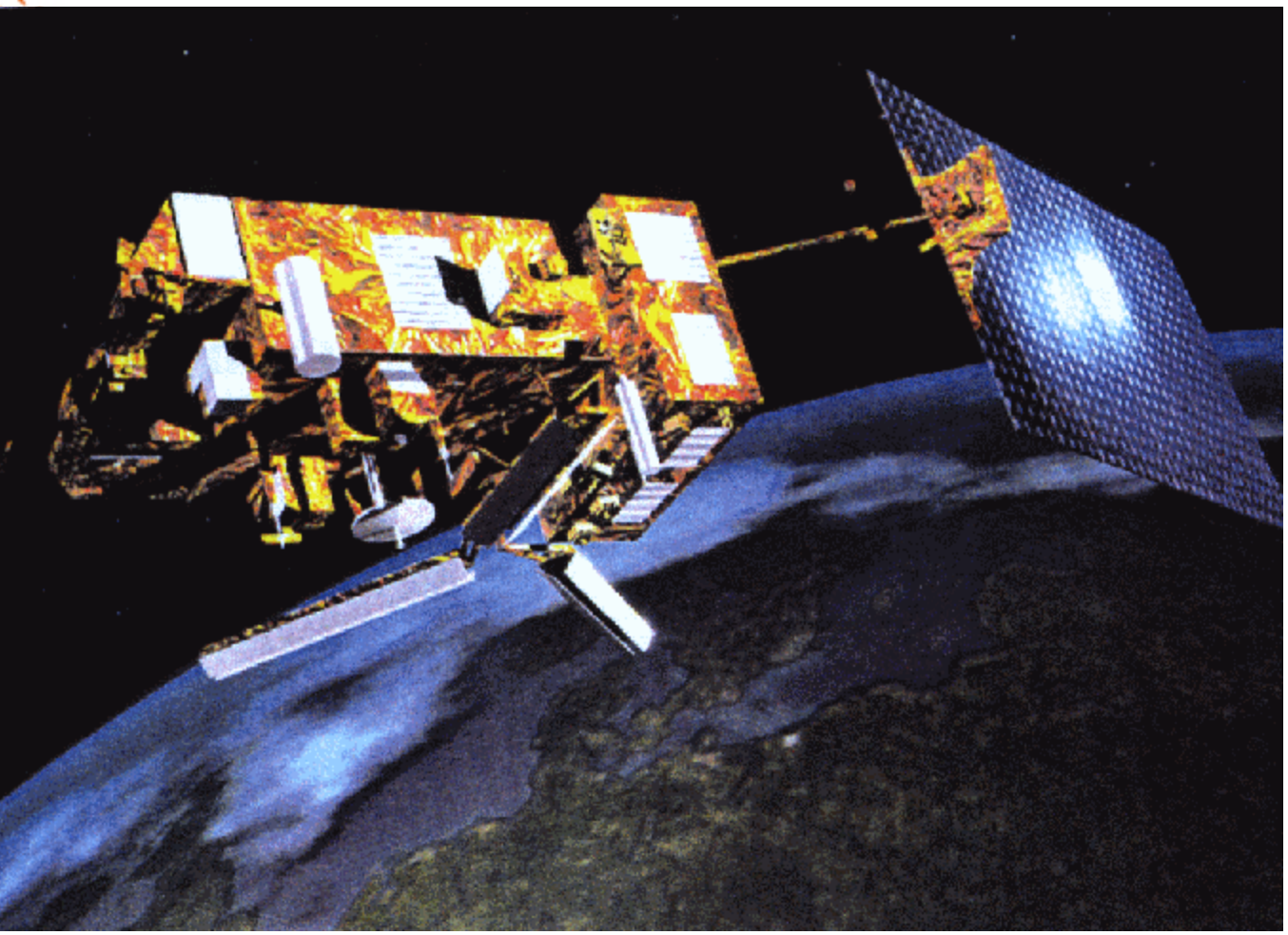
EPS Instruments and Products

José Prieto
Training Officer, USER SERVICE
EUMETSAT
Am Kavalleriesand 31
D-64295 Darmstadt
Germany
THANKs to Dr Dieter Klaes

Programme: EUMETSAT Polar System (EPS)

- European Contribution to the Initial Joint Polar System (IJPS
- Scheduled launch of the first Metop Satellite April 2006
- AM orbit at 9:30 LST (descending node)
- Three recurrent models
- Central and distributed Ground Segment components
- 14 years of operation



height: 7,6 m
length: 6,8 m
width: 3,7 m

solar panels: 11,3 m

power: 3900 W
(end of life)

lifetime: 5 years

13 instruments

mass: 4500 kg
mass of the instrumen
840 kg

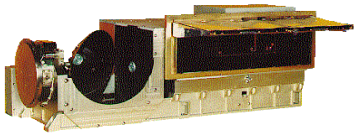
data flow: 2250 kbps

The Metop satellite

Geostationary and Polar orbits

(Typical values)

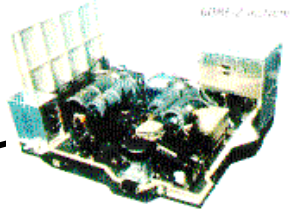
	GEO	LEO Imager
Image Repeat Cycle	15'	12 hour
Coverage	1/4 World	World
Distance to Earth (D)	36000 Km	850 Km
Pixel size (S)	25 km2	1 km2
Integration time (t)	10-5 s	10-4 s
Energy/pixel ($S.t/D^2$)	1	1000
Accuracy (NeAT)	1 K @ 300 K	0.03 K @ 300 K

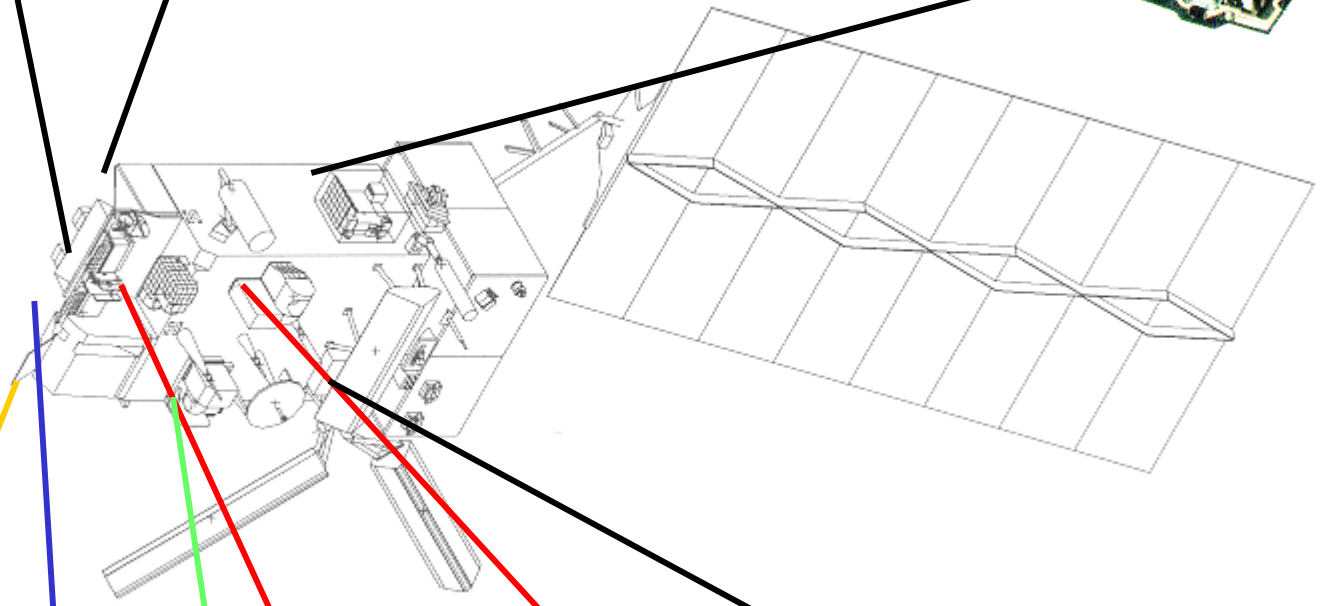


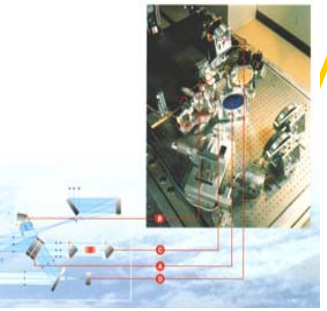
AVHRR

GRAS

GOME



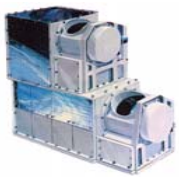




IASI

HIRS

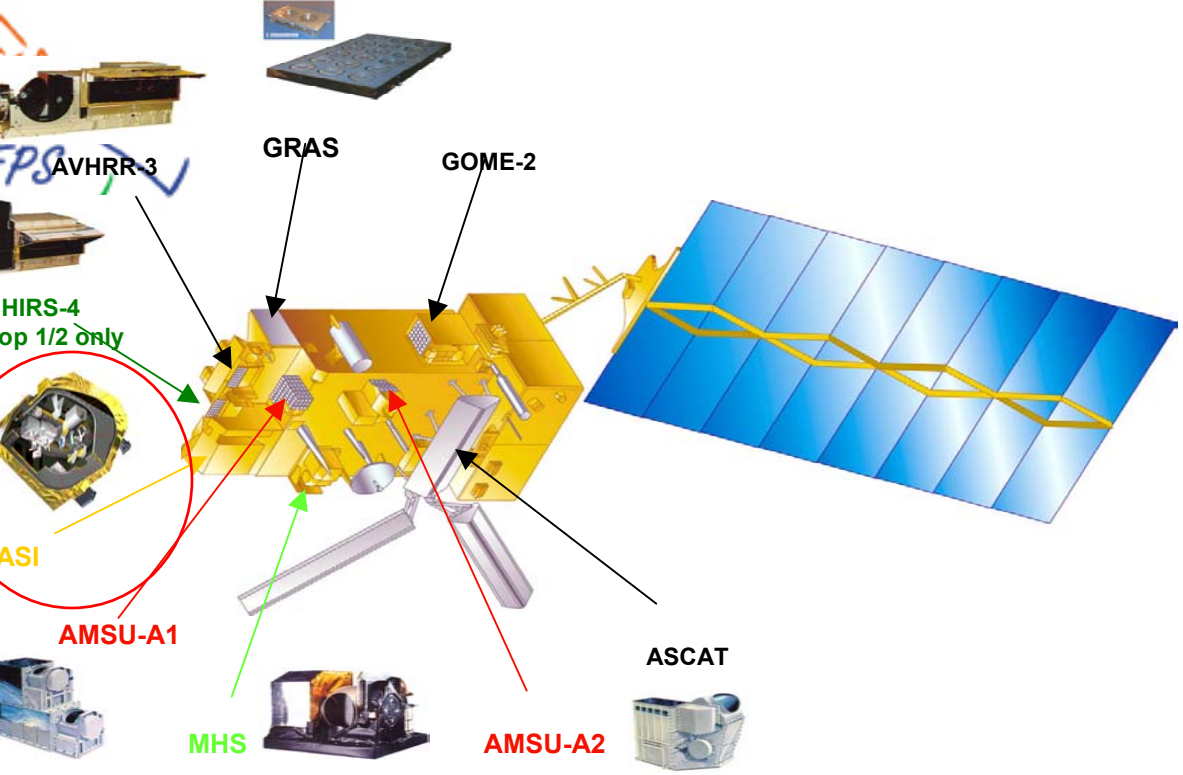
MHS



AMSU-A1

AMSU-A2

ASCAT



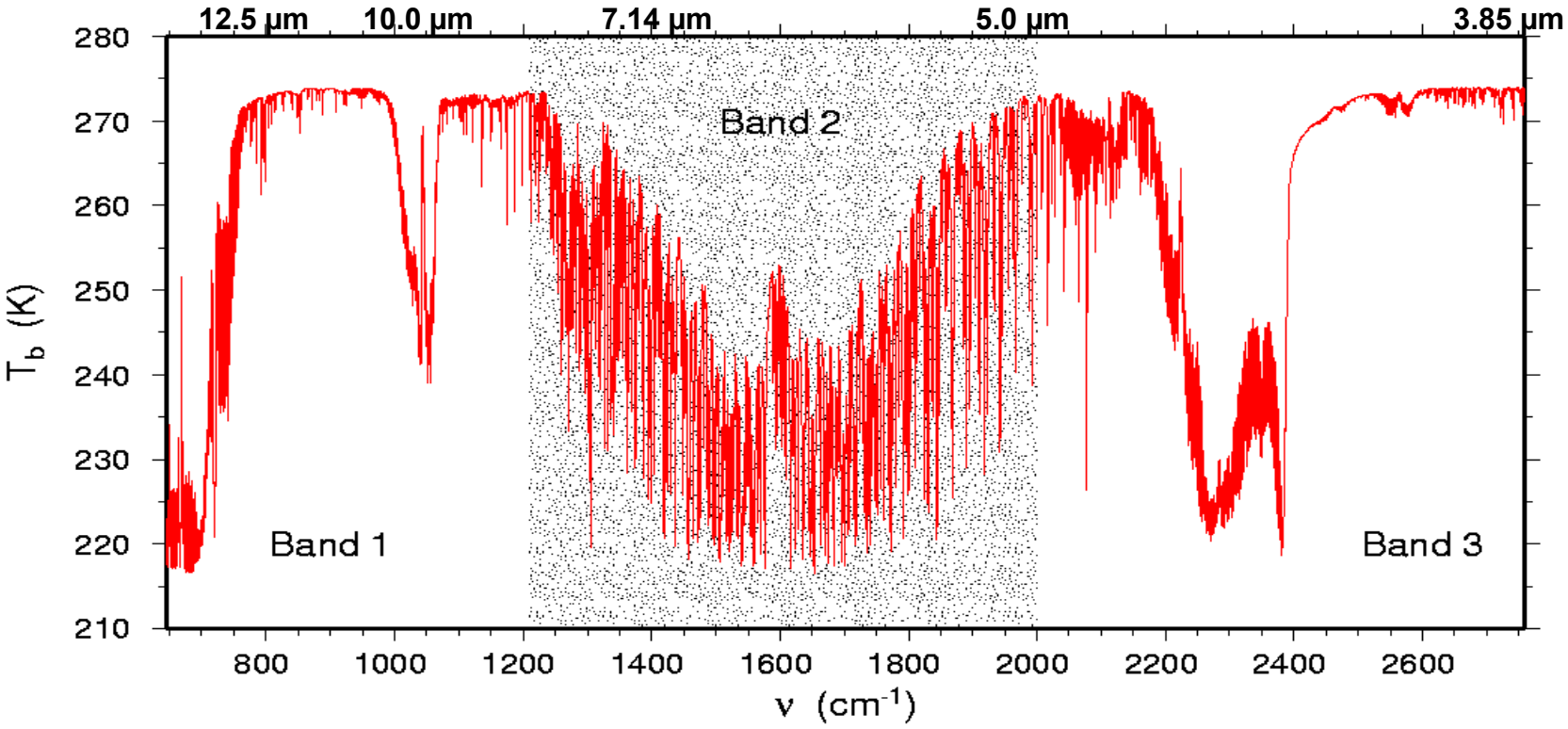
IASI

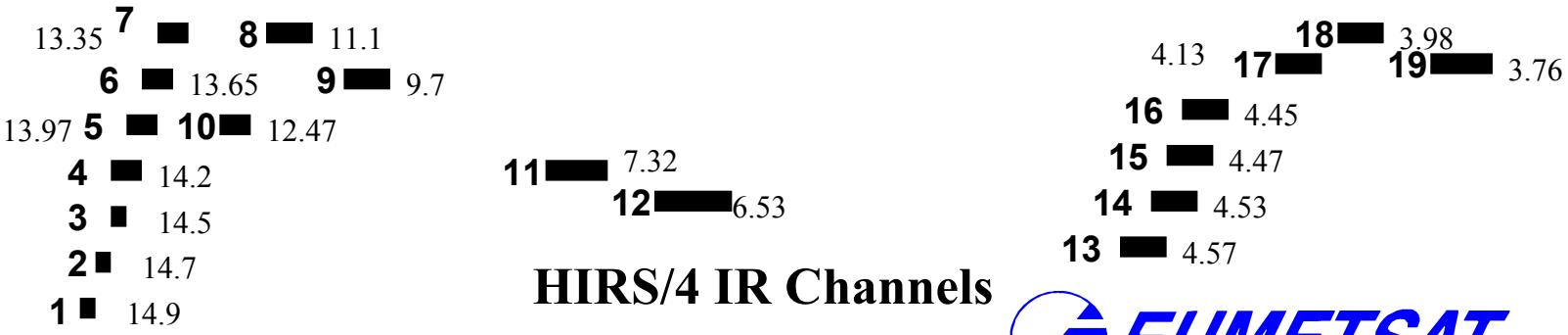
Infrared Atmospheric Sounding Interferometer

New technology for Infrared Sounding

Significant improvement compared to HIRS

IASI Bands

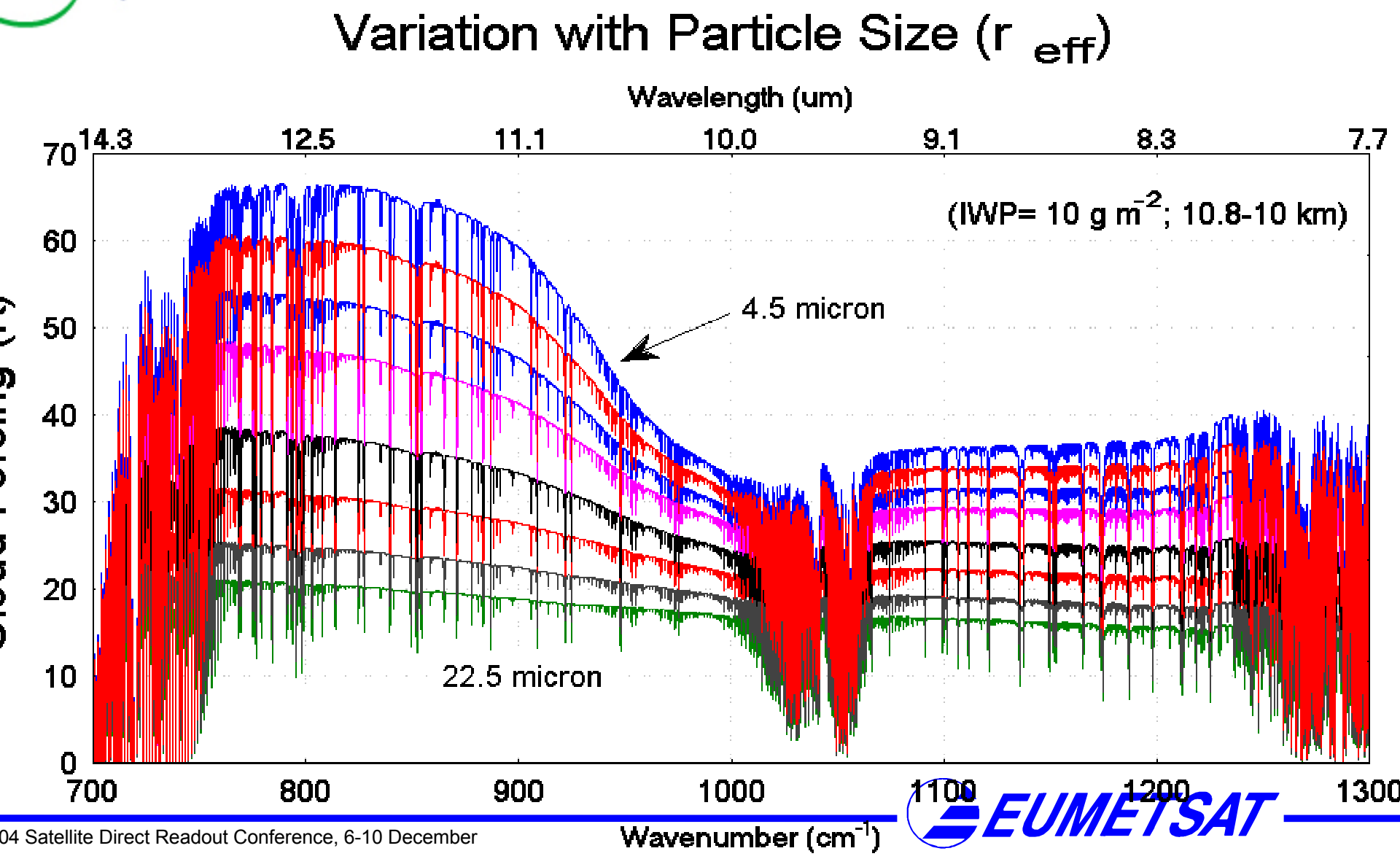




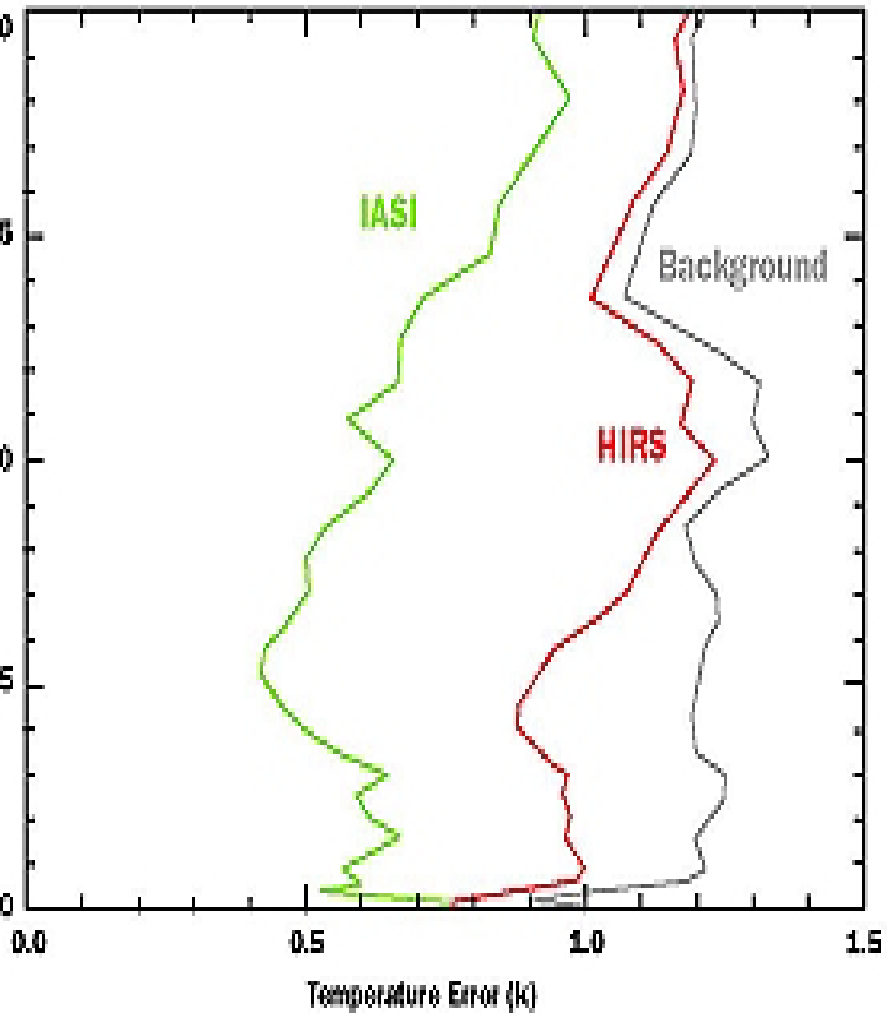
HIRS/4 IR Channels

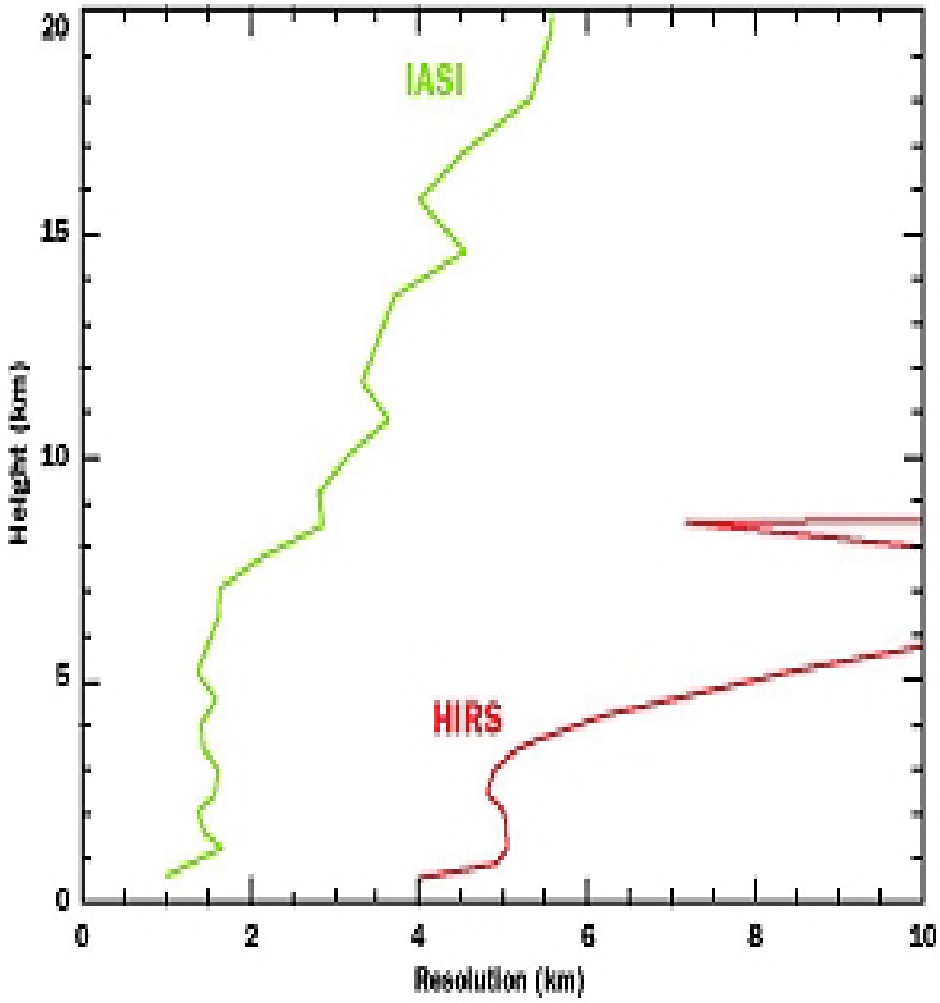
Cloud properties

(University of Wisconsin Madison, 2003)

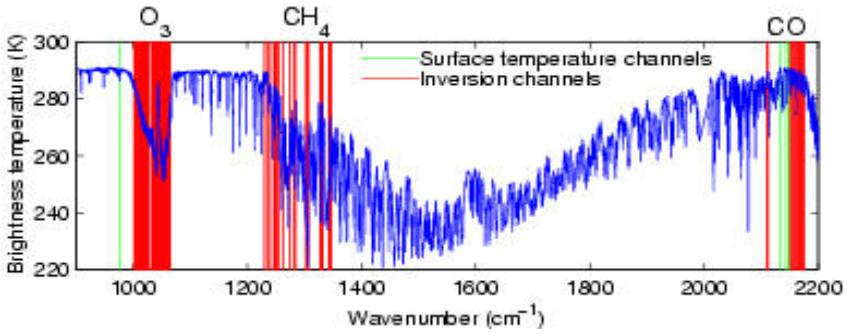


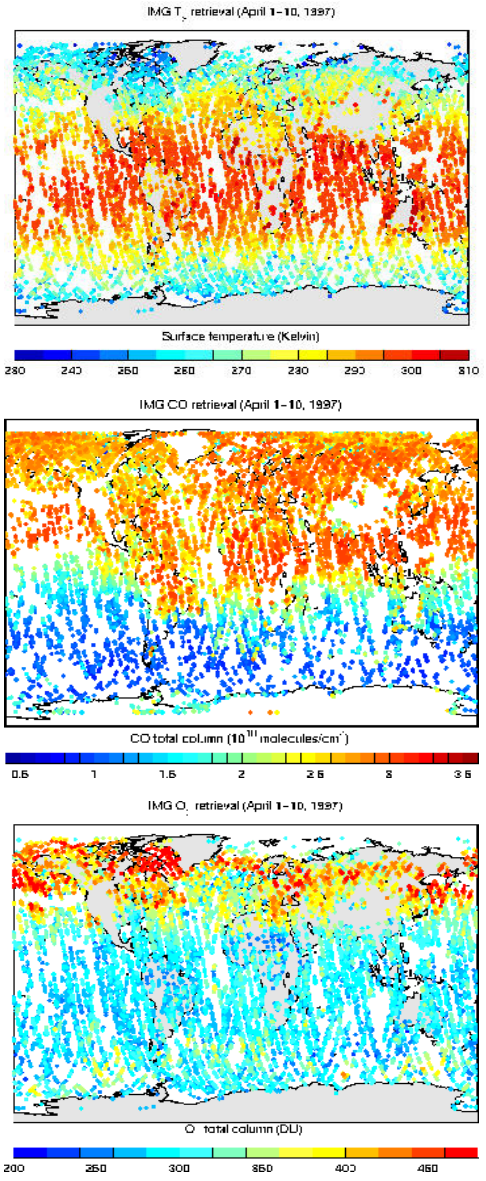
IASI versus HIRS



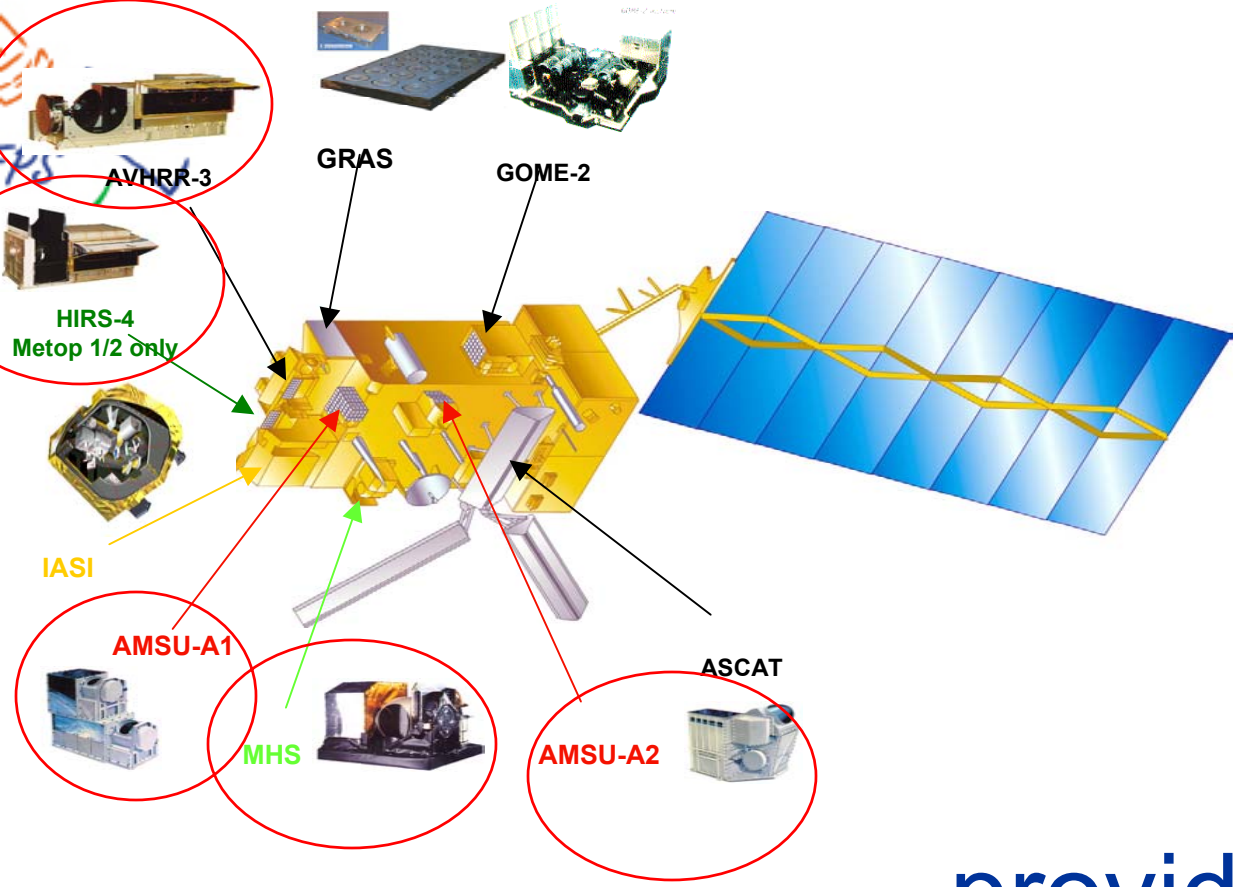


Potential for Trace Gas Retrieval





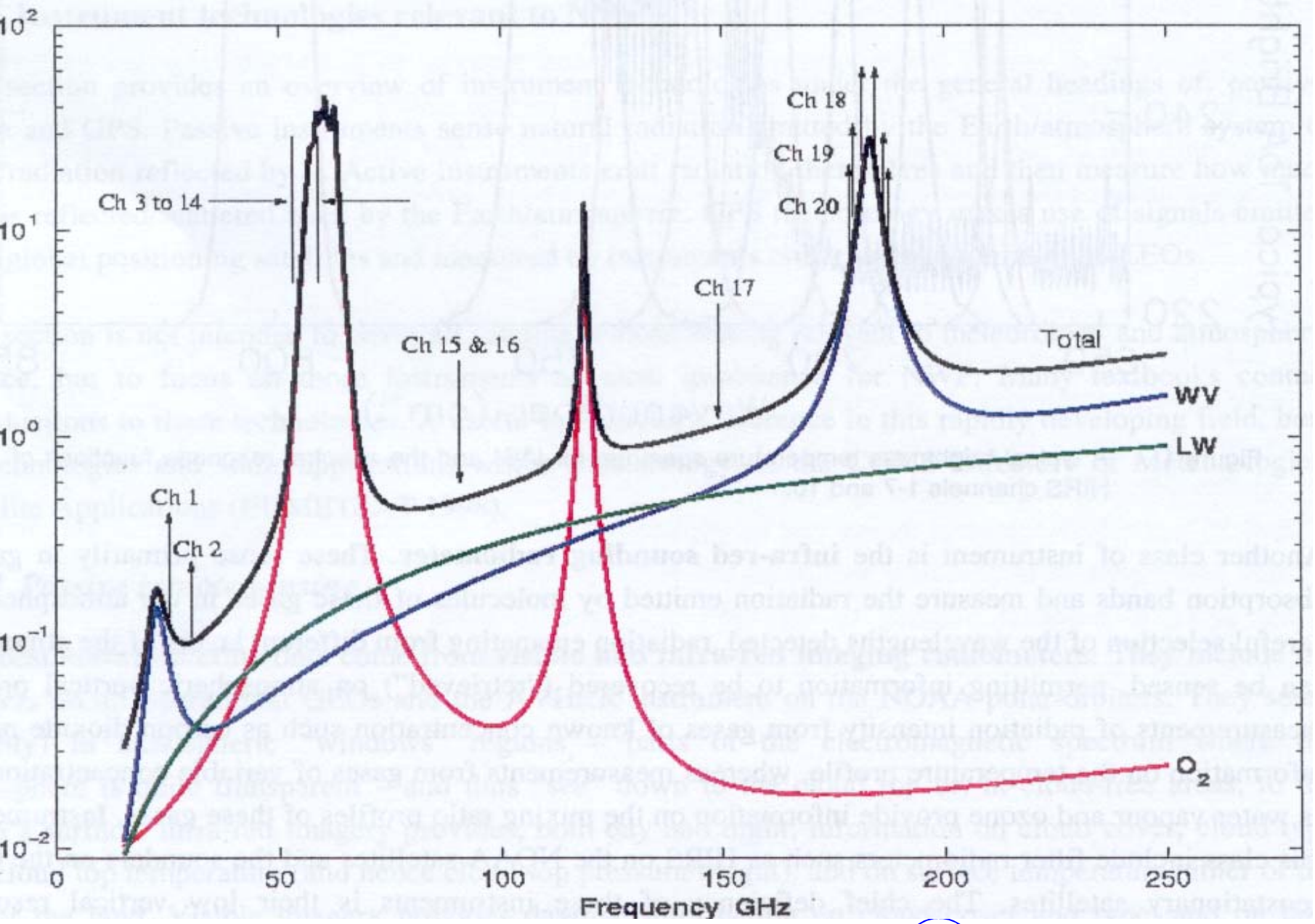
Clerbaux et al., 2003



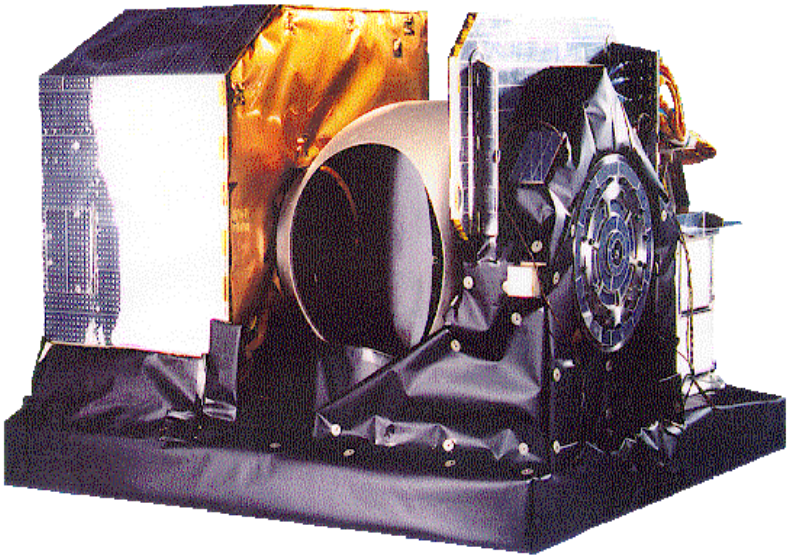
ATOVS and AVHRR

...provide

continuity to current system


Ch 18
Ch 19
Ch 20
Ch 3 to 14
Ch 17
Ch 15 & 16
Total
WV
LW
Ch 1
Ch 2
O_2
10^2
10^1
10^0
10^{-1}
10^{-2}
0
50
100
150
200
250
Frequency GHz

The Microwave Humidity Sounder (MHS)

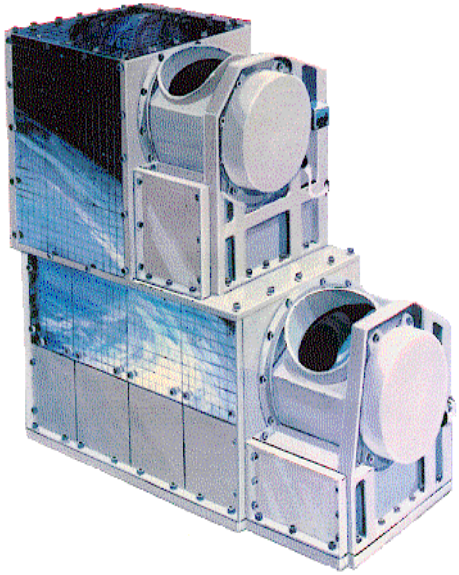


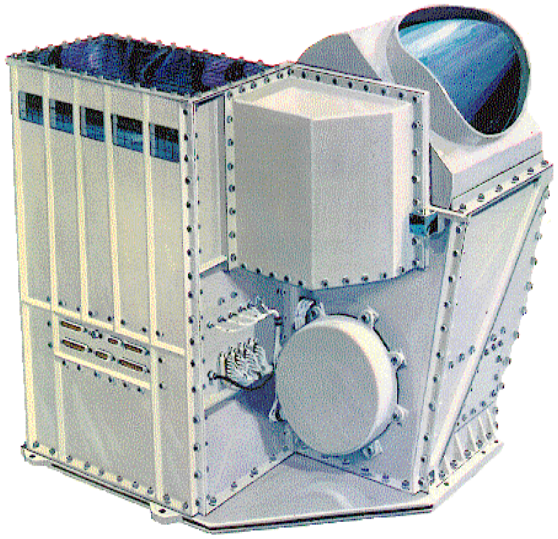
Objectives: atmospheric humidity profiles, cloud and surface characteristics.

Five channel, passive microwave radiometer.

MHS is a successor to the AMSU-B instrument flown on NOAA-K,L,M. Microwave radiation is focussed by the rotating reflector and separated into four RF channels by dichroic plates. Further separation of one of these channels is performed at the IF stage by a diplexer. All channels are linearly polarised.

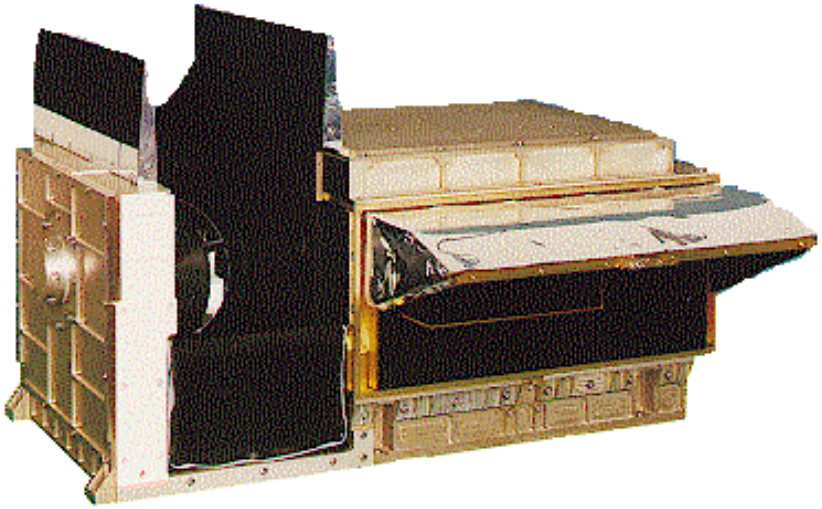
The AMSU-A Sounding Instrument (1)





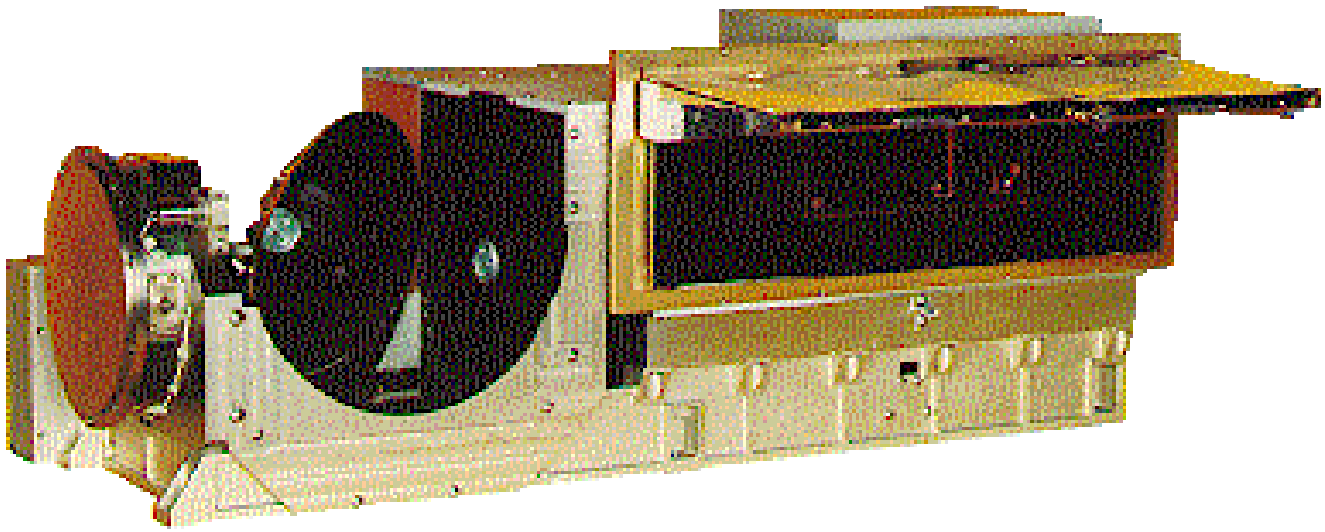
- **Objectives: atmospheric temperature profiles, surface emissivity characteristics.**
- **Fifteen channel, passive microwave radiometer.**
- **The instruments consists of two separate modules: AMSU-A1 (13 channels) and AMSU-A2 (2 channels). AMSU-A1, itself, has two separate reflectors.**

High-Resolution Infra-red Radiation Sounder (HIRS)



- **Objectives: atmospheric temperature and humidity profiles, total ozone column, cloud cover.**
- **Infra-red (19 channels) and visible (1 channel) radiometer.**
- **Radiation is reflected from a 45# scan mirror and focused by the optics onto three separate detectors: one for the visible, one for the shortwave IR channels and one for the longwave IR channels. Channel separation is performed using a filter wheel (rotated at each scan mirror position).**

Advanced Very High Resolution Radiometer (AVHRR)



Visible and infra-red imagery for sea surface, land surface and cloud.

Six channel, visible and infra-red radiometer

Scan mirror, beamsplitters, dichroics, cryogenic radiator.

Switchable 1.6 / 3.7 micron

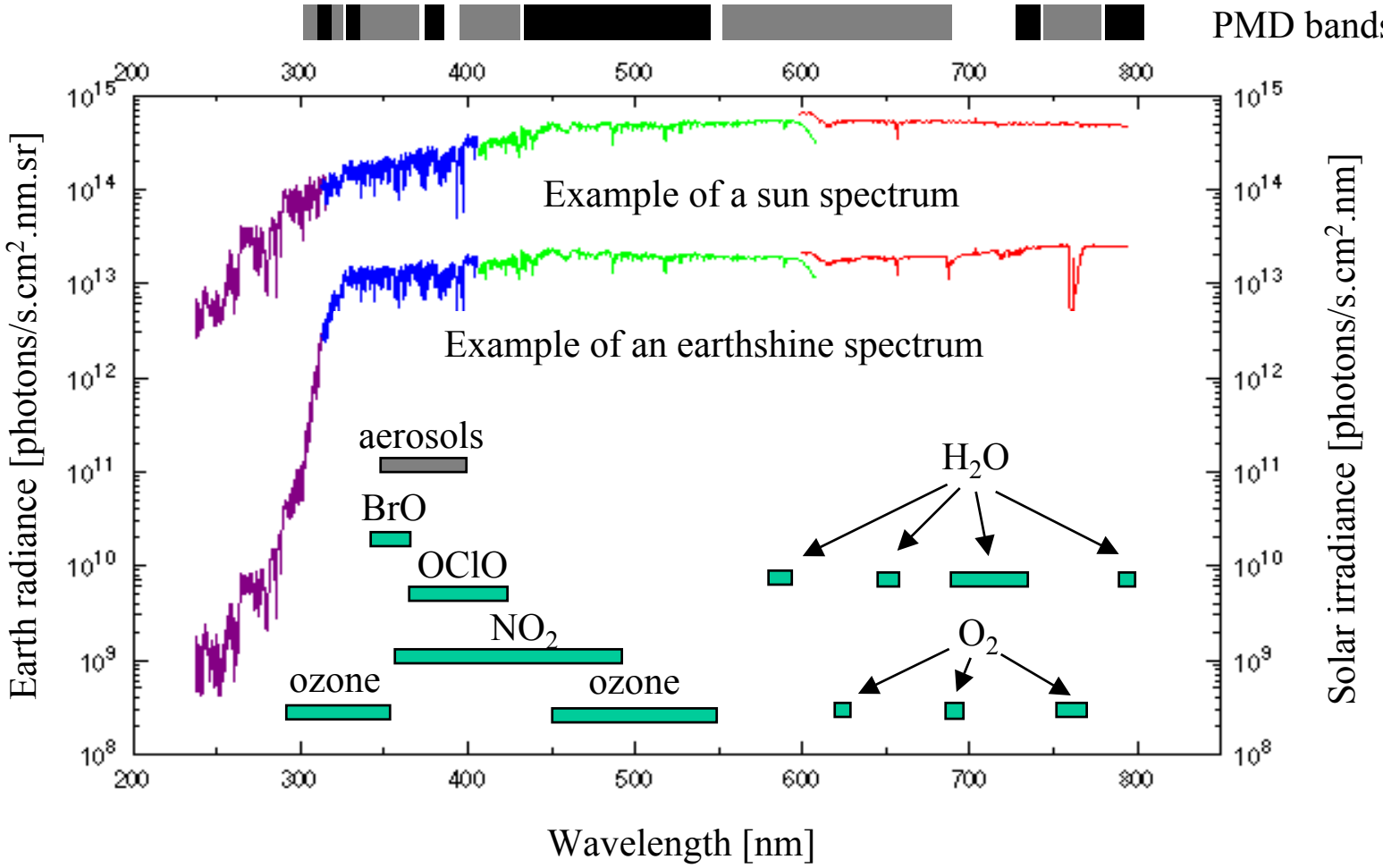
Mission: Ozone monitoring ...

GOME Instrument

GOME-1 Calibration lamp

from Hahne, 1998

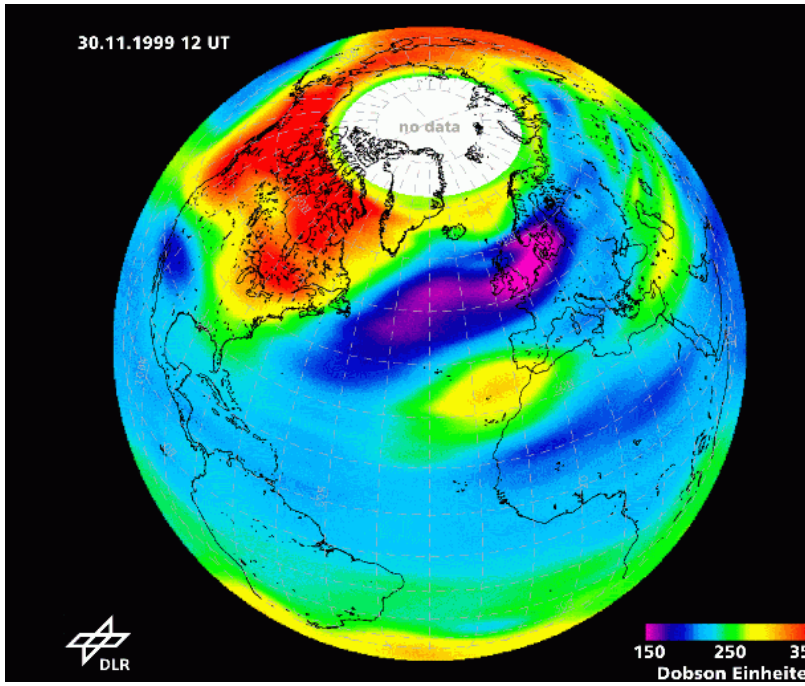
GOME-2 channels and potential for retrieval of species



Source: ESA, Callies et al. 2000

GOME-2 Level 1 Ground Processor Prototype Output

Level 2 and higher products will be generated in the SAF

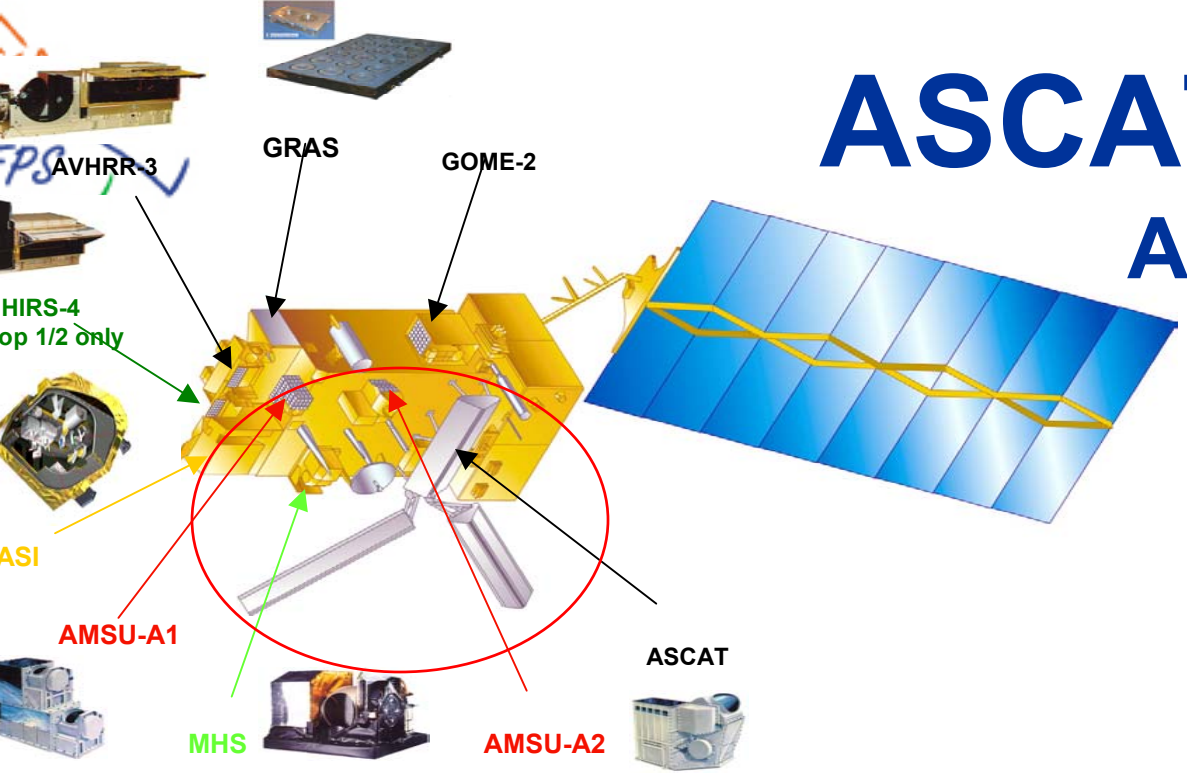


GOME/ERS-2 30 November 1999
Global ozone column concentration. Low concentration of ozone over north Atlantic and north Europe due to dynamically induced ozone loss in the lower stratosphere.
Source: DLR

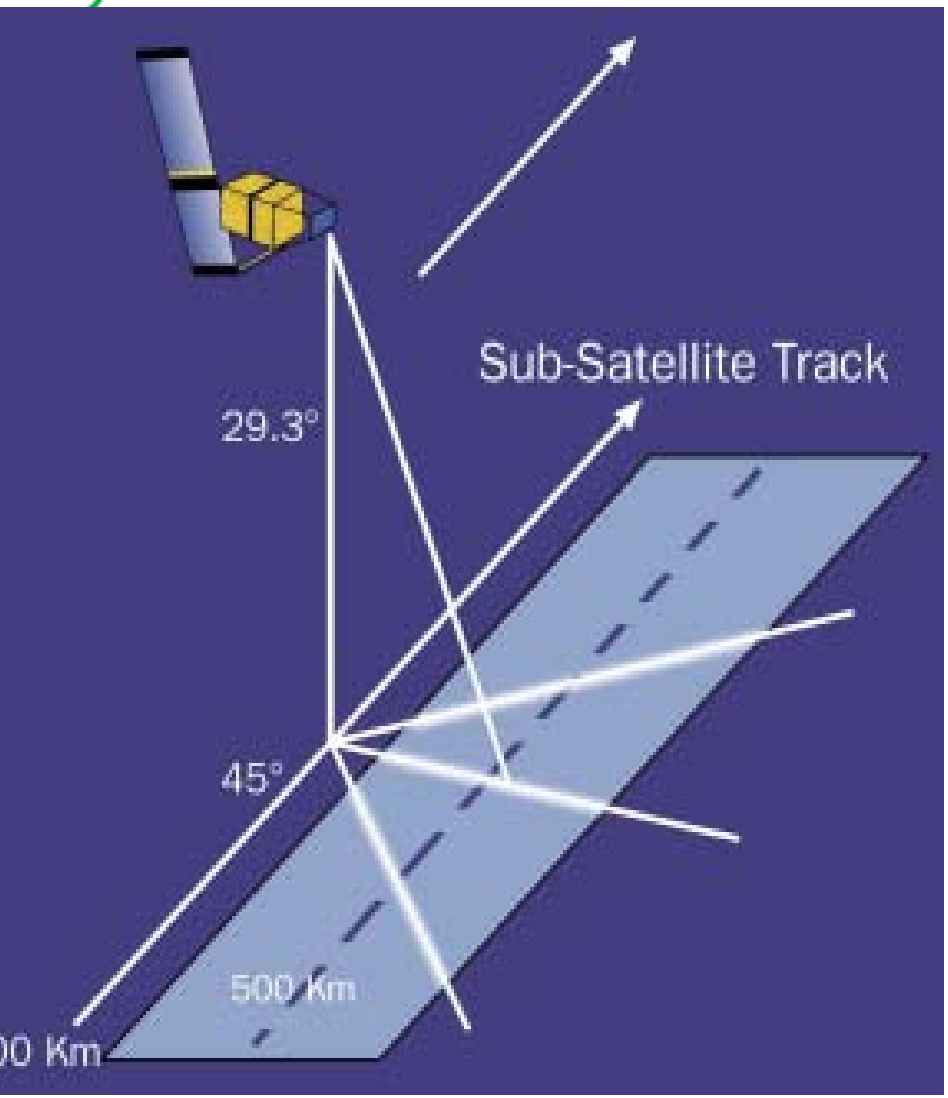
Atmosphere - Ocean Interaction ...

ASCAT

Advanced Scatterometer



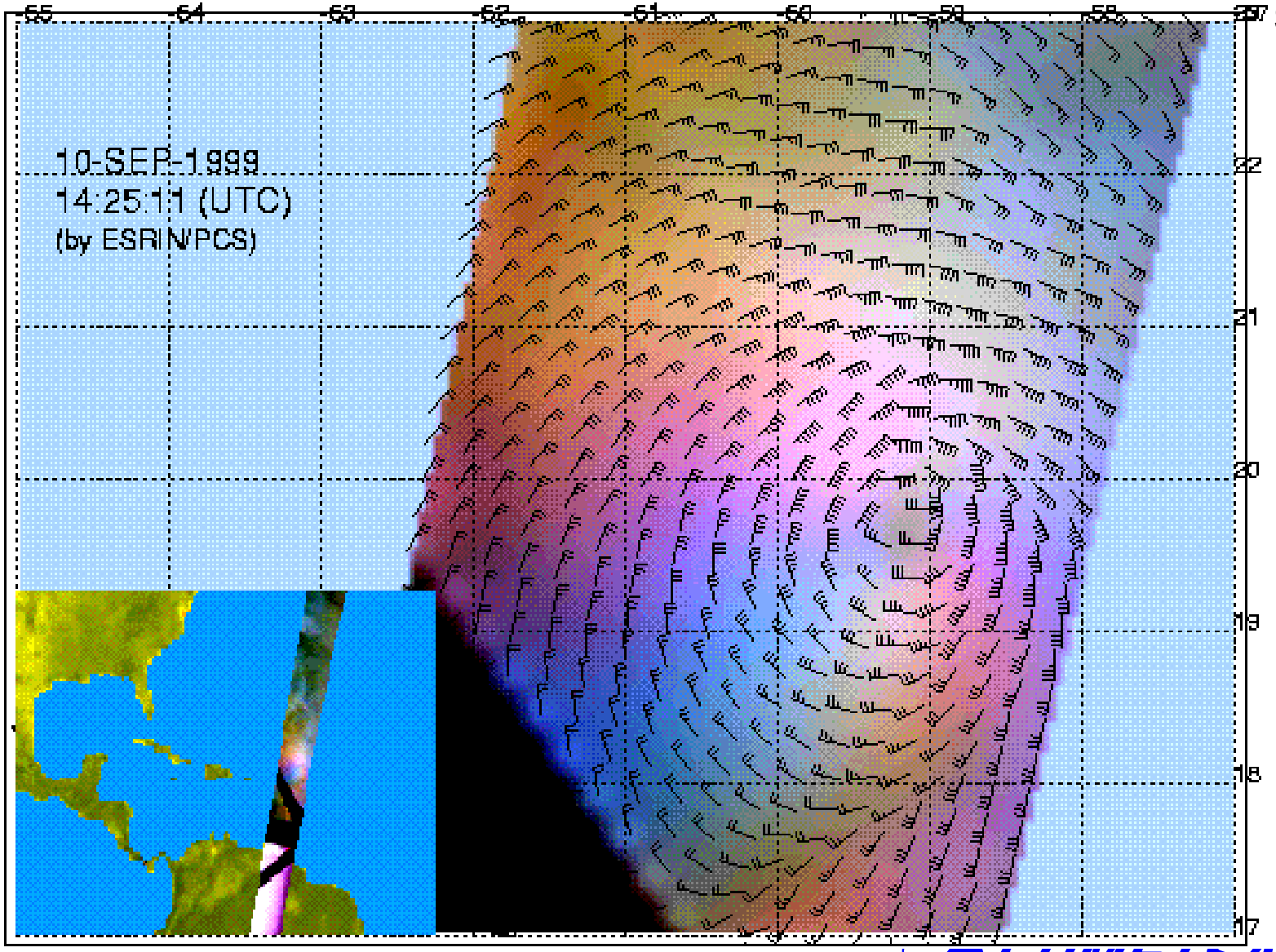
Research Instruments become operational



DESCRIPTION

- It is an active radar type of instrument. Derived from ERS-1 scatterometer.
- Designed to measure wind speeds and direction over open sea.
- It will also help to monitor snow and ice distribution over land and sea.

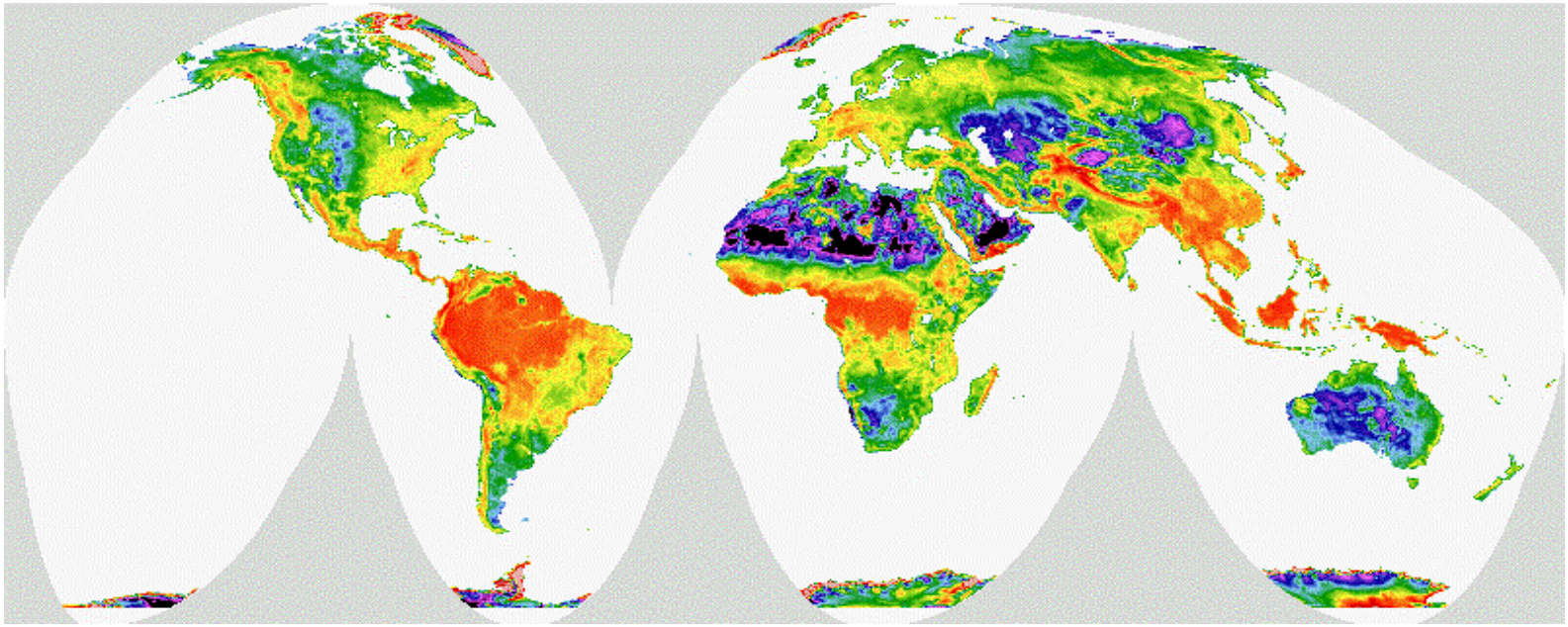
ERS WIND VECTOR FIELD (500 KM SWATH)



Source: ES

Scatterometer land application: Vegetation and Surface Roughness

- Scale compatible with major vegetation biomes and soil groups (climate-driven)
- Compared to AVHRR and SSM/I, global scatterometer maps exhibit more contrasts (Prigent et al., 1999, 2001)



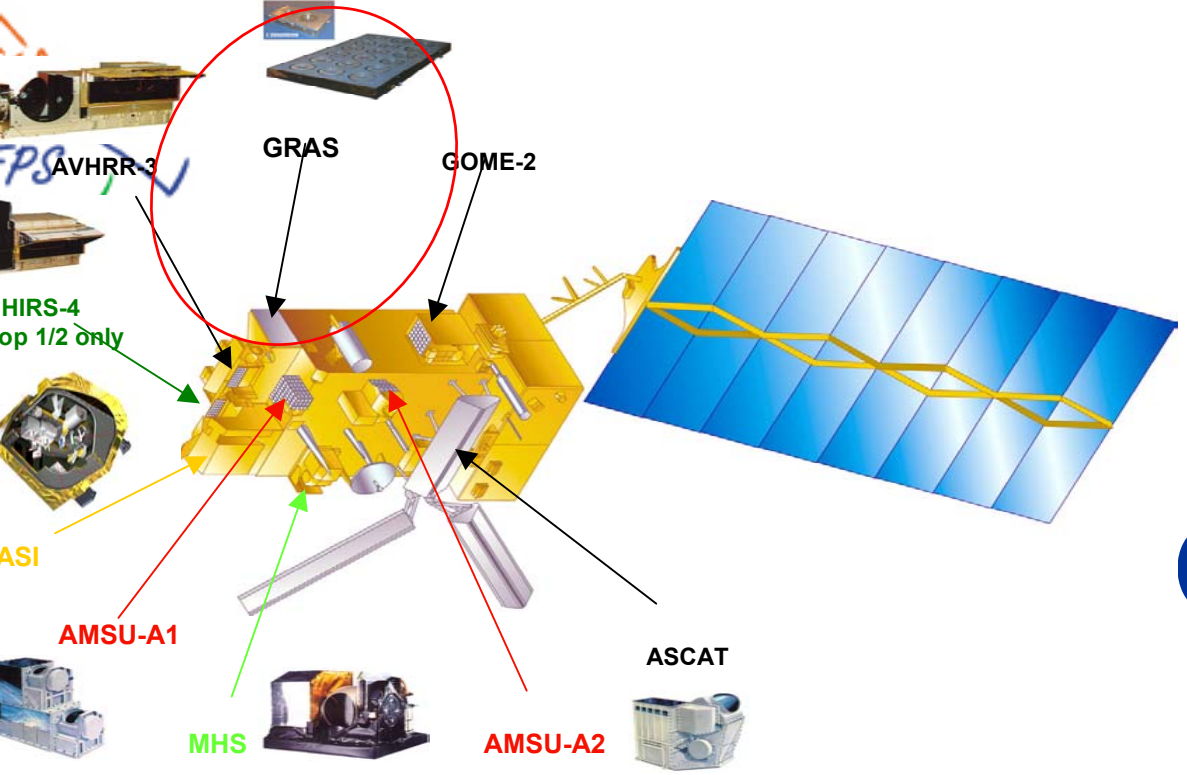
Global backscatter map © IFARS

Wagner, 2001

DLR

EUMETSAT

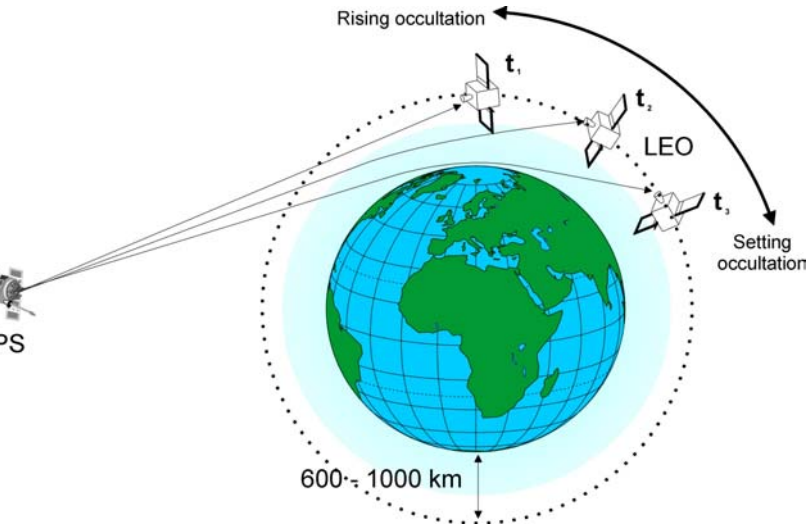
And limb sounding ...

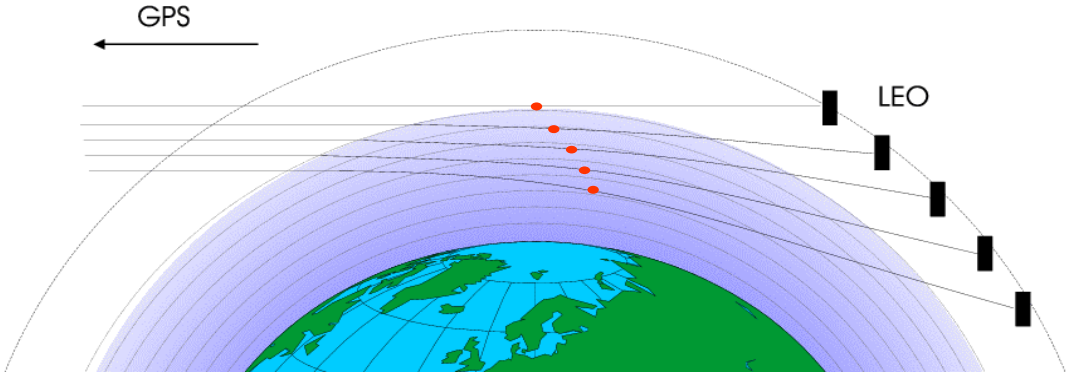


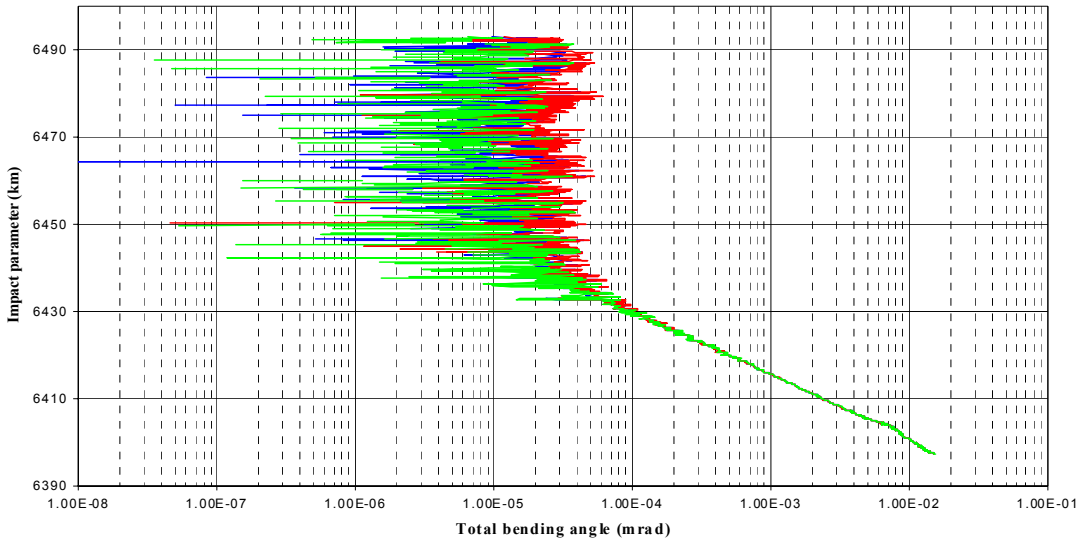
GRAS

GNSS Radio-occultation Atmospheric Sounder

GRAS: limb sounding by occultation of GPS signa



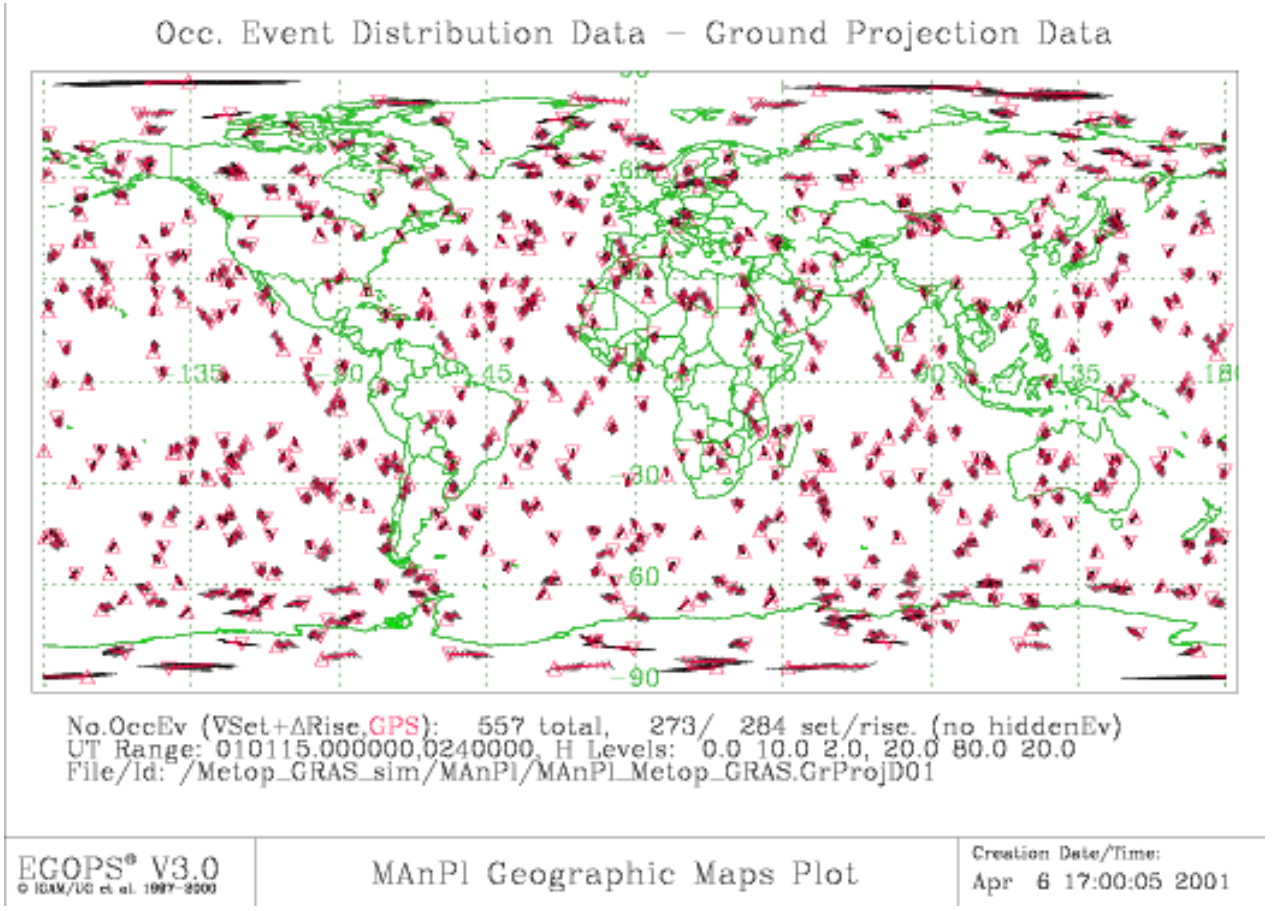




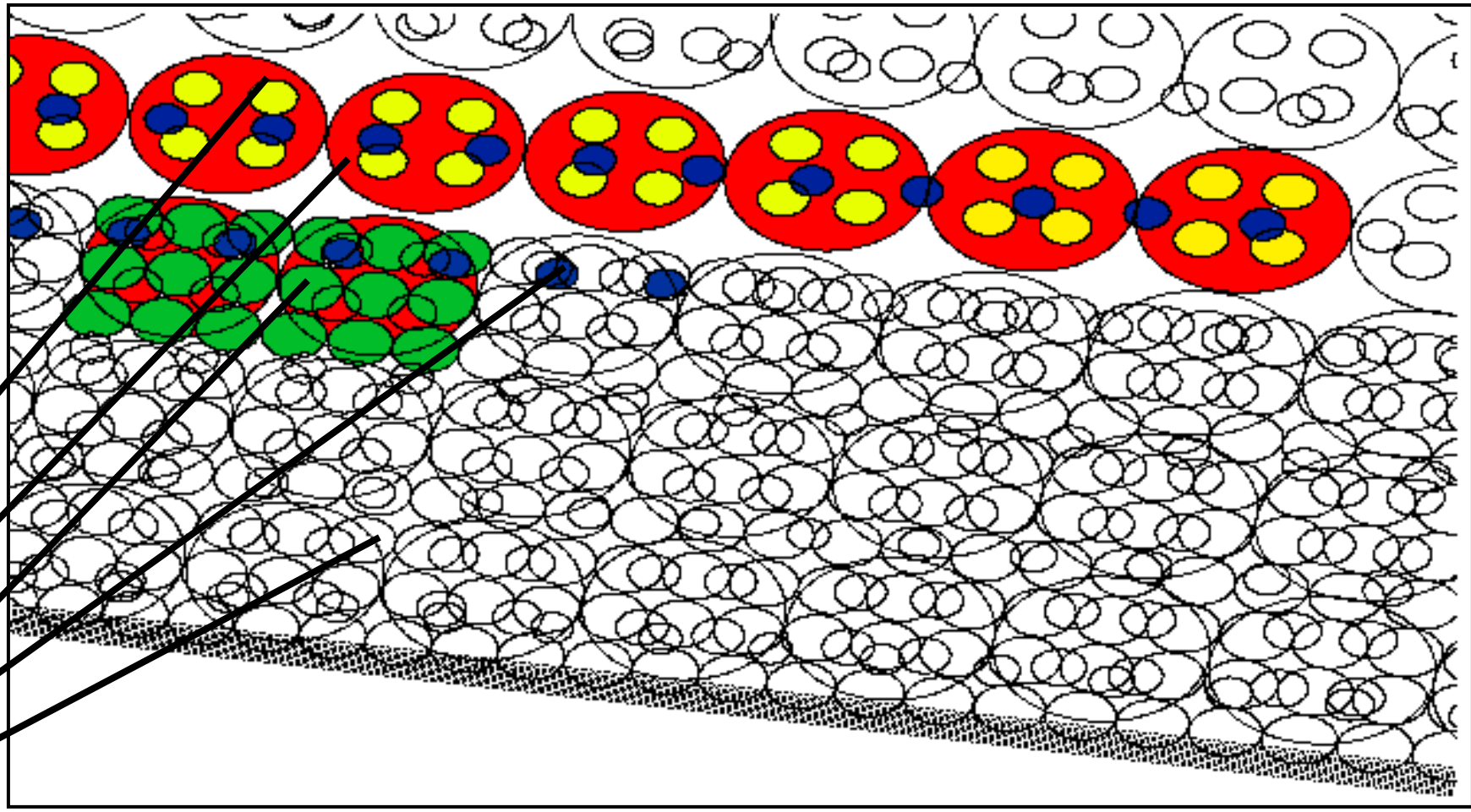
from L2
from L1
ionospheric correction applied

From Luntama (2000)

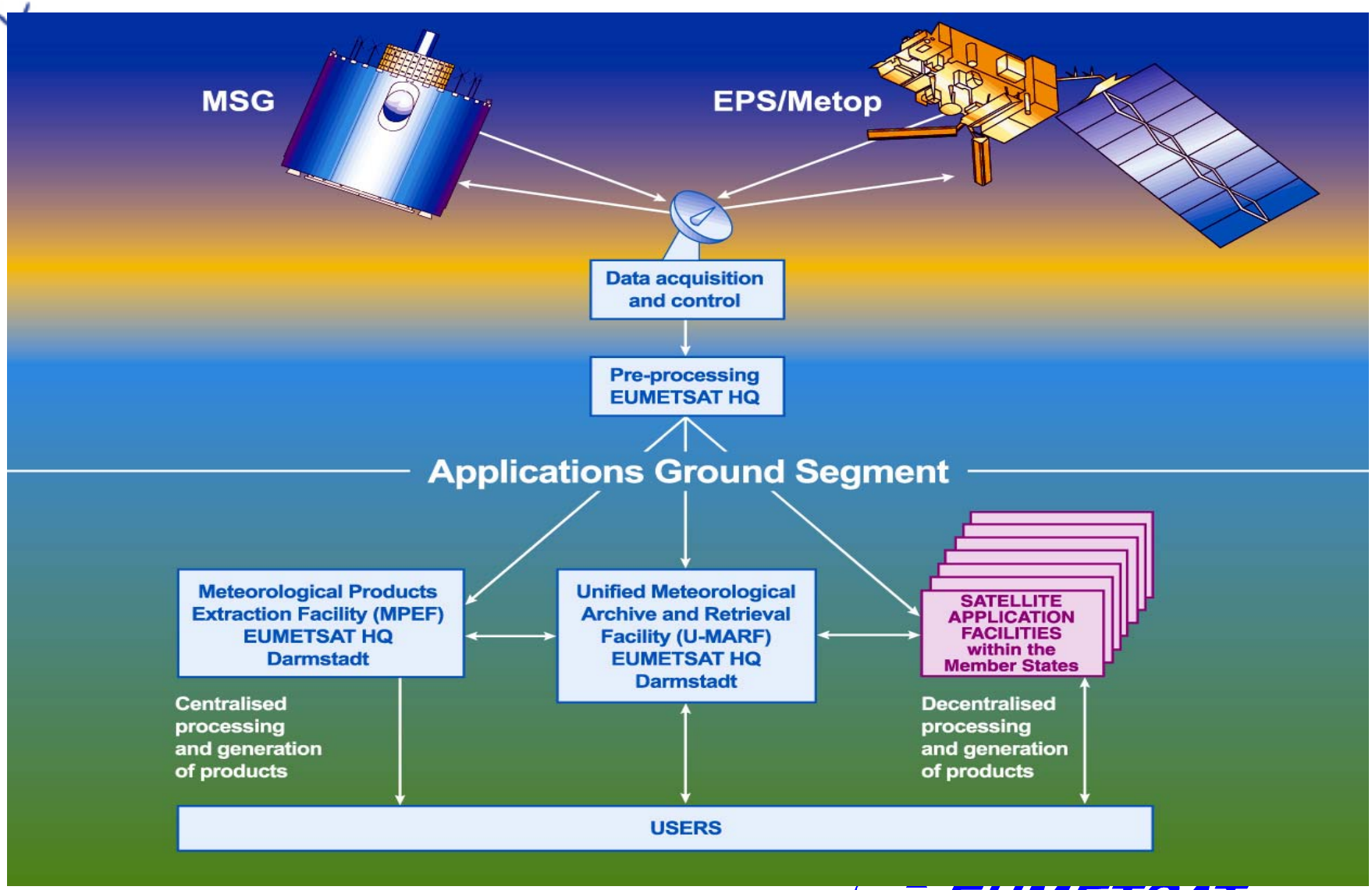
Global distribution of simulated EPS GRAS Observations over 24 h



Overview of Instrument FOVs



EUMETSAT Ground Segment



EPS summary

- Improved sounding for NWP
- Continuity
- Calibrated (level 1b, level 1c for IASI) instrument data
- Source for Satellite Application Facilities (SAF)
- Archive
- Service till 2020 in meteorology and climate